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(54) Method of and keyboard for inputting characters on pattern element basis

(57) A method of inputting characters and/or symbols on a pattern element basis using a keyboard can be used to input ASCII, Greek, Arabic, Japanese and Chinese characters as well as any other characters or symbols whose structure can be expressed as a combination of pattern elements without changing the key markings. It provides an easy to use, simple, general purpose and light in weight, small in size device for computer, telephone, game machine or any digital system where keyboard input in necessary.

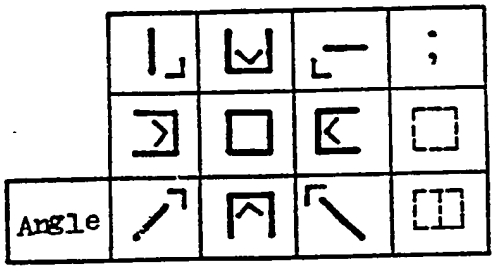


Fig. 1

GB 2 243 704 A

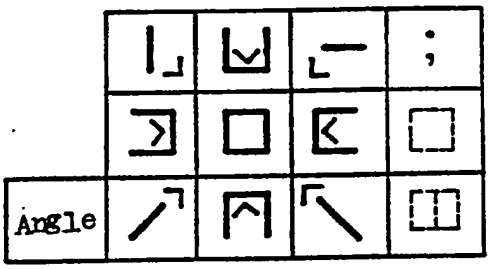


Fig. 1

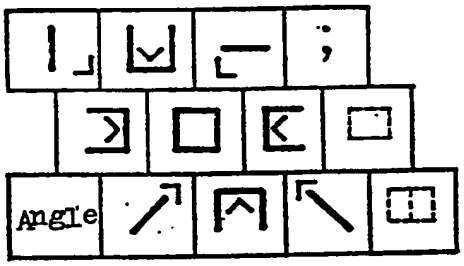


Fig. 2

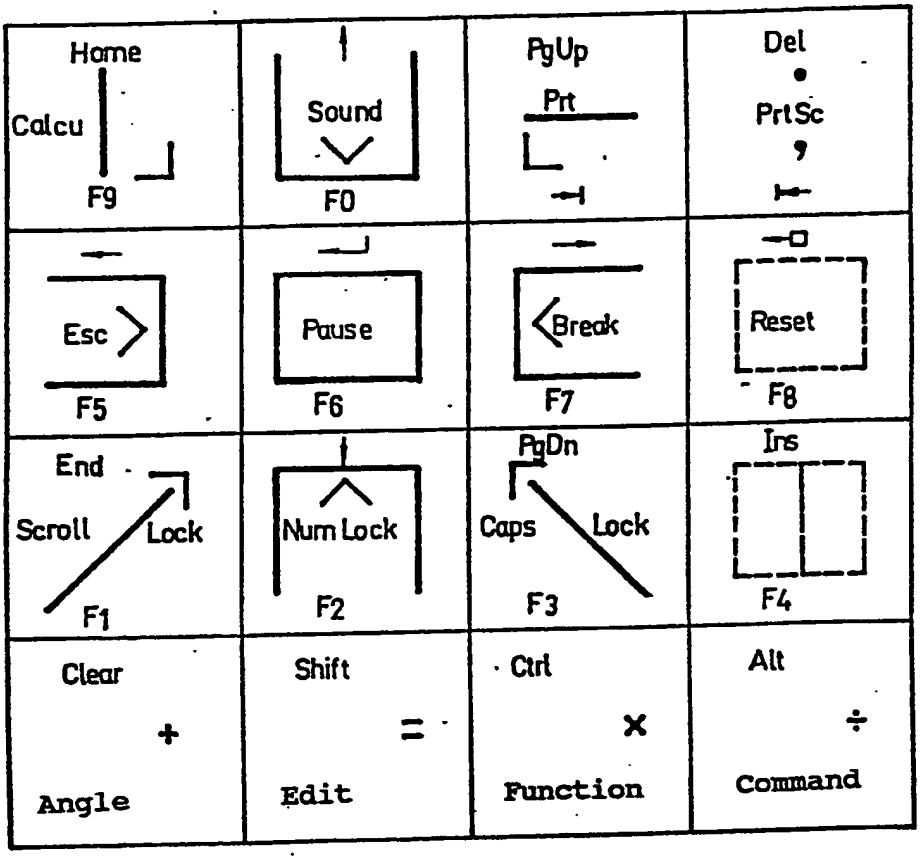

Home
Calcu
F9
Sound
F0
PgUp
Prt
Del
PrtSc
Esc
F5
Pause
F6
Break
F7
Reset
F8
End
Scroll
Lock
F1
Num Lock
F2
PgDn
Caps
Lock
F3
Ins
F4
Clear
+
Angle
Shift
=
Edit
Ctrl
×
Function
Alt
÷
Command

Fig. 3

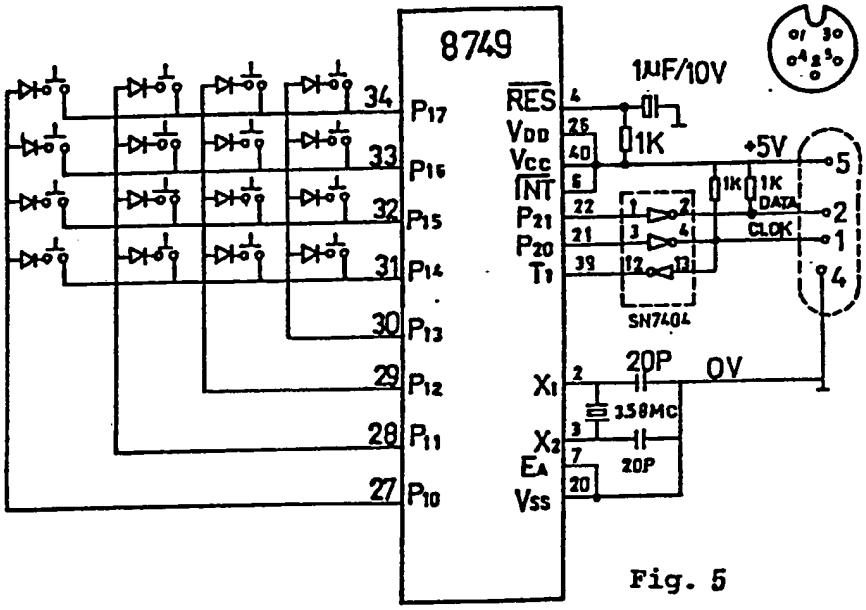

8749
1μF/10V
RES
VDD
Vcc
INT
P21
P20
T1
X1
X2
EA
Vss
P17
P16
P15
P14
P13
P12
P11
P10
34
33
32
31
30
29
28
27
1K
+5V
DATA
CLOK
SN7404
20P
0V
3.58MC
20P

Fig. 5

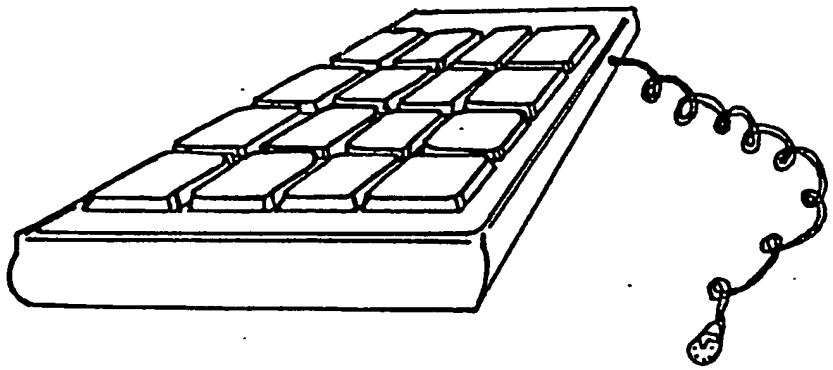
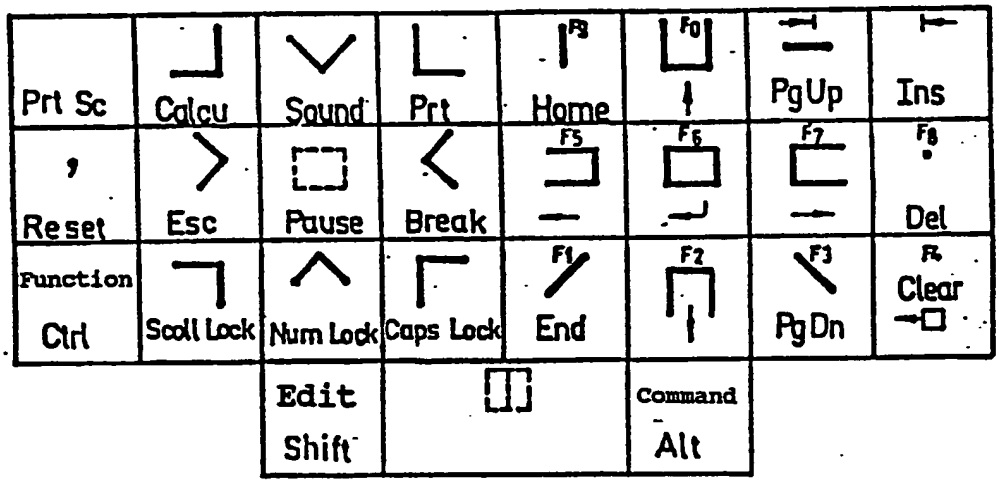


Fig. 4

Fig. 6


Prt Sc
Calcu
Sound
Prt
Home
PgUp
Ins
Reset
Esc
Pause
Break
Del
Function
Ctrl
Scoll Lock
Num Lock
Caps Lock
End
PgDn
Clear
Edit
Shift
Command
Alt

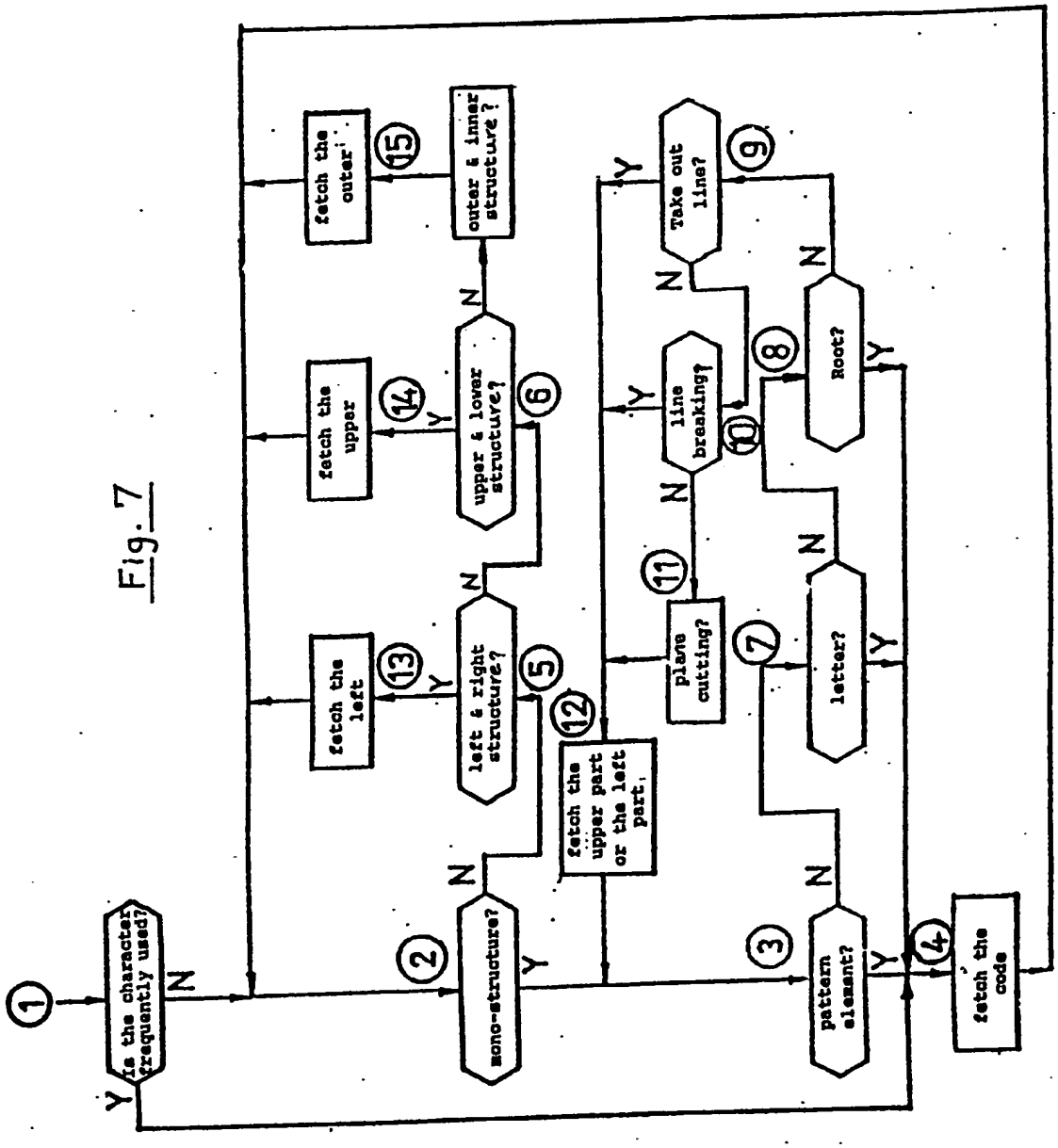

1
Is the character frequently used?
Y
N
2
mono-structure?
Y
N
3
pattern element?
Y
N
4
fetch the code
5
left & right structure?
Y
N
6
upper & lower structure?
Y
N
7
letter?
Y
N
8
Root?
Y
N
9
Take out line?
Y
N
10
line breaking?
Y
N
11
plane cutting?
12
fetch the upper part or the left part
13
fetch the left
14
fetch the upper
15
fetch the outer
outer & inner structure?

Fig. 7

Method of and keyboard for inputting characters on pattern element basis

This invention relates to a method for inputting, e.g. to a computer, characters and/or symbols involving, more particularly, the input of structural features representative of the character/symbol to be inputted and to a keyboard especially designed for putting the method into effect.

The conventional computer keyboard is based on the keyboard of a standard English typewriter with additional edit and function keys. The number of keys on such keyboards varies from tens to over one hundred, e.g. the keyboard of the Appla Ccmputer has 52 keys, the IBM-PC has 83 keys and the IBM PS-2 has 101 keys. The miniaturization of the keyboard poses problems if there are too many keys. If the miniaturization is accomplished, the keys are small and/or located close together resulting in keys frequently being mis-touched thereby hindering the typing operation and decreasing the usability of the keyboard. The currently used methods of inputting characters on a conventional computer keyboard are mainly direct methods. That is, the characters are assigned to respective keys in one to one correspondence. Although this method is straight forward, it has some significant drawbacks. Firstly, with the expansion of the input character set, the number of keys also increases. Secondly, the characters marked or represented on the keys have to be changed when the input character set is changed. This not only brings about difficulties in miniaturization of the keyboard but also causes inconvenience when inputting a large character set or altering an input character set.

Chinese Patent Specification No. 86104850 entitled "An zi Jie Multi-functional Language Processing Device on coding basis --- An Zi Jie Writing Machine" describes an invention which is intended to solve this problem. It

suggests a small keyboard with 20 keys. On the top of each key there is marked two letters, one numeral or punctuation mark and other patterns or script. Although the number of keys on the keyboard is reduced, it is only possible to input characters that are marked on the keys in a direct way. For those characters that are not represented on the keys, it is necessary to adopt a coding method to input them. However to remember all the possible coding combinations is difficult. If characters of different languages are involved, it is necessary to alter the marks represented on the keys. This would cause even more inconvenience when characters of several different languages are to be inputted.

It is difficult to input Chinese characters. It is even more difficult to input Chinese characters on a standard English keyboard. If inputted by phonetic code, duplication code rate will be very high and it is impossible to type without looking at the keyboard. In order to input Chinese characters by a structural coding method, over six hundred Chinese character parts need to be assigned to, and represented or marked on, the keys. Due to the large number of character parts involved the keyboard cannot hold them. However it is possible to select about 100 or so frequently used character parts and to mark them on the letter and numeral keys. Thus the input of Chinese characters can still be carried out by a structural coding method on a conventional keyboard. The invention entitled "Optimized Five-stroke Coding Method and Its Keyboard" and described in Chinese Patent Specification No. 85100837 works in this way. Since one key is used to represent several character parts, duplicated codings are unavoidable when a number of different character parts are being used to code a character. In order to eliminate or reduce the duplication codes, it is necessary to adjust the combination of parts on each key and this leads to a situation where the parts represented on a single key are quite different to each other in shape. This makes it difficult

to remember the locations of more than one hundred parts on the keyboard. In fact the five-stroke coding method lists more than one hundred and ninety frequently used parts. It is necessary to remember mechanically all parts represented by the letters. The problem of duplicated codings still exists and it is necessary to distinguish the duplication codes by combining "character form" and "last stroke" to form an identification code. It is very inconvenient to operate.

It is likewise inconvenient to input graphical symbols on the standard English keyboard, on which there are no proper elementary patterns suitable for constructing the graphical symbols to be entered. In order to input a designated graphical symbol (for example, the symbol of a transistor), it is necessary to use a letter or a numeral to stand for it. If the graphical symbol to be inputted is marked on the keys, then it would be troublesome to change to a different set of graphical symbols. Each graphical symbol may be associated with a number and the correspondence relationship displayed on the computer screen, thus the memory burden for users would be increased and the screen space available for the user would be smaller.

The present invention has two primary aims. One is to provide an intuitive, general purpose and flexible method for inputting characters of different languages, such as English, Russian, Arabic, Japanese, Korean, Chinese etc., as well, preferably, as graphical symbols. The other aim is to provide a keyboard with a relatively small number, e.g. only a dozen or so, keys with which it is possible to input the characters of different languages, e.g. French, German, Russian, Arabic, Japanese, Korean, Chinese etc. and ASCII characters (and possibly also various graphical symbols) without altering the representations marked on the keys or requiring the provision of mechanical memory.

According to one aspect of the present invention a

method for inputting characters and/or symbols is defined in the ensuing claim 1. According to another aspect of the present invention a keyboard for inputting characters and/or symbols is defined in ensuing claim 14.

For a conventional computer keyboard, a large input character set requires a large number of keys. To alter the input character set, the corresponding marks represented or marked on the top of the keys have to be changed. Study shows that, although the character set varies from language to language, they can be considered as being composed of some basic patterns as □ ⊔ ⌊ | • , etc., different characters being composed of a different number, and orientation, of the simple patterns. If these simple patterns and their possible different orientations are marked on the keys, it is possible to directly identify which keys are struck according to the shape of the character without need of mechanically remembering the codes, and it is also unnecessary to alter the marks represented on the keys for inputting characters of different languages. A "space" character may be added to facilitate the input of character strings and a square of dashed or dotted lines may be used to represent such a "space" character. In order to indicate whether the combination of two character components is an upper and lower structure or a left and right structure, there is provided a character indicating combination mode, for example a double square of dashed or dotted lines , which can be used to show that two character components are combined in a left and right structure. In this way the possible orientations of the patterns □ ⊔ ⌊ | • , □ □ etc. which may occur in the characters are marked on the keys and a character is inputted by striking the keys according to its combination of patterns.

It will be noticed that the pattern ⊔ has generally four possible orientations that may appear in a character, i.e. ⊔ ⊓ ⊐ ⊏ ; pattern | also has generally four

possible orientations | — / \ ; pattern L has generally eight different orientations ⌋ L ⌐ ¬ V ∧ < > ; and patterns □ □ □ • , each have only one orientation. All these patterns can be regarded as basic elements from which characters are composed and will be referred to as "pattern elements". All characters can be regarded as different combinations of these pattern elements. Thus characters can be inputted by striking keys according to a combination of pattern elements.

There are altogether 21 pattern elements as described above. If each key is marked with a separate pattern element, 21 keys are needed. To reduce the number of keys, some keys can be marked with two pattern elements. The nine pattern elements ⌋ L ¬ ⌐ V ∧ > < , can be considered as one group. Their common feature is that they all (apart from ",") have an angle, thus each of these pattern elements can be called an "angle pattern element". Each angle pattern element is paired with a corresponding one of the other pattern elements, namely the nine pattern elements ⌊ ⌈ ⌋ ⌊ | — / \ . An additional key is required for "angle" pattern selection and three keys for the patterns □ □ □ Thus 13 keys are required for performing the functions of the 21 pattern elements, nine keys being marked with the patterns ⌊ ⌈ ⌋ ⌊ ⌊ ⌐ / ⌐ \ ; three keys being marked □ □ □ and an additional "angle" pattern selection key.

For convenience of remembering and locating the positions of the pattern element keys, the 12 pattern element keys can be arranged in an array of 3 rows and 4 columns, with □ mark key in the middle, ⌊ mark key above it , ⌈ mark key below it , ⌋ mark key on the left , ⌊ mark key on the right, ⌊ mark key at its upper left side, ⌐ mark key at its upper right side, / mark key at its lower left side and \ mark key at its lower right side. These 9 pattern keys are just arraged as a "#". Because of the symmetrical arrangement, the positions of

keys are easily remembered. To the right side of this ♯ are arranged three symbol keys;  ; as illustrated in Fig.1.

Although characters are all composed of line segments, the distinction between the various characters resides not in the shape of lines, but rather in the feature of the space defined by the lines. For example, letter A can also be written as  , this is because both of these characters consist of a pattern with a closed area and a closed pattern with a downward opening. Though the numbers of line segments that constitute them are different, they would still be identified as letter A. For further example, the numeral 8 can also be written as  (as shown in a 7-segment digital display). Although one representation is formed of curved lines while the other of straight line segments, they will still be recognized as the numeral 8. In characters, the circle  , the square  , the semi-circle and the triangle and other closed characters

sometimes can be recognized as the same character. They all define a closed area and can be represented by the pattern element □ .

To obtain satisfactory results in inputting characters and symbols by means of a combination of pattern elements, certain rules must be observed and the correct methods employed.

Firstly, the characters and the symbols should undergo a pre-processing of "set separation" and "branch cutting":

Set separation —— to separate the characters into several relatively independent sets, and to process each set separately. For example, the character " + " stands for the plus sign on an ASCII keyboard, whereas in Chinese characters, it stands for the numeral 10. Thus the Chinese character set and the ASCII character set should be distinguished to avoid ambiguity.

Branch cutting —— to remove the non-essential information of characters. The magnitude of the angle included between two line segments is not too important and may be substituted by a right angle. Thus the letter "Z" may be written as " ㄥ ", the Chinese character "刀" as "冂" and the Japanese "ヌ" as "ヲ" and will not cause confusion in their respective character sets. The small hook of some of the lines is also dispensable. For example, if the Chinese character "才" is written as "扌", and the Japanese "セ" as "七", it will not cause confusion.

When a combination of pattern elements is used to represent a character, the essential prerequisite is the decomposition of the character. To ensure the uniqueness of the decomposition, the following rules should be followed:

Juncture breaking —— to divide or cut off a character at the intersection ——————————————————

of lines or planes, rather than at the middle of the line or of the plane, for example. "尸" can be cut into "口" and "丨" or "口" and "厂", but it can not be cut into "冂" and "尸".

Taking the bigger —— the pattern first to be divided or cut off should include as many line segments as possible. For example, "土" should be cut off into "十" and "一", rather than "⊥" and "⊥".

There are four ways of decomposing a character:

Line taking out —→ to take certain lines out of a set of intersecting lines and divide them into two sets of lines. For example, when writing the Chinese character "申", according to the normal order of writing, "日" is first written, then "丨". When decomposing it, naturally "丨" is taken out first and the character is decomposed as a combination of "日" and "丨". In the same way, the characters "田" and "甲" can be decomposed as a combination of "日" and "丨". Likewise, the characters "工土干" are decomposed as a comnination of "一", "丨" and "一". So these characters will be decomposed into the same combination of patterns. The cause for the duplication code is that decomposition in this way cannot correctly reflect the relative position of the intersection of lines.

Line breaking —— to break the line at the intersection. For example, "申" can be decomposed into "丨", "田", and "甲" can be decomposed into "田" and "丨"; and "由" can be decomposed into "丨" and "田". This method of decomposition will lead to an increase in the total number of lines and is relatively inconvenient, but it can correctly reflect the relative position of the intersection of lines and

therefore has a low rate of duplication coding.

Plane cutting —— to divide at the intersection of two areas, taking the character as a combination of several planar figures. For examples, the letter "H" can be divided into two planar figures "凵" and "冂". In this method, the total number of line segments increases even more, but the number of pattern elements does not increase and it can reflect the relative position of the intersection of lines more correctly and accurately, thus the rate of duplication coding is even lower.

Mixed cut --- a mixture of uses of the three methods mentioned above. For example, the character "聿" is first divided into "⺕" and "⺻", and "⺻" is broken into "十" and "丁", finally, "⺕" is cut into "⺕" and "⺕".

Decomposition should be carried out according to the rule of first upper then lower, first left then right and first outer then inner, otherwise the results obtained would not be unique. Arrangement should also be in this order, otherwise it can not reflect correctly the relative positions of the various parts of the character. For example, the character "花" should be decomposed into "艹"、"亻" and "匕" according to the rules of first upper then lower, and first left then right; the character "国" should be decomposed into 冂王. according to the rule of first outer then inner, and the character "囚" should be decomposed into 冂人 according to the rule of first outer then inner, and the character "乘" should be decomposed into 禾北. according to the rule of first upper then lower.

For some complicated characters the resultant pattern

element strings from the decomposition are quite long. If all of the pattern elements are to be inputted, there will be too much key-striking and the speed of input will be too low. In order to increase the speed of input, the number of pattern elements inputted should be reduced, but it should be ensured that no duplicate codes will result. For example, the Japanese katakana "木" can be decomposed into four pattern elements — | / \ by the method of "line taking out ". For the character set of katakana, taking three pattern elements — | \ as representative will cause no duplicate coding. The Greak letter " Ⓐ " can be decomposed into three pattern elements □ ⊔ ⊓ by the method of "plane cutting", and if only two pattern elements □ ⊔ are selected to represent it, no duplication code will occur.

A character will be decomposed into a sequence of pattern elements, and these pattern elements should be inputted one by one in the correct order. In so doing, the number of keystrikes may be too large and the speed of input too low. In order to increase the speed of keyboard input, several keys can be pressed simultaneously thus several pattern elements are inputted at the same time. But the sequence information of the pattern elements will be lost, and the loss of sequence information will cause duplicated coding. For ASCII character set, this loss of information will not cause duplicated coding, so it is possible to input a character by a single strike of key.

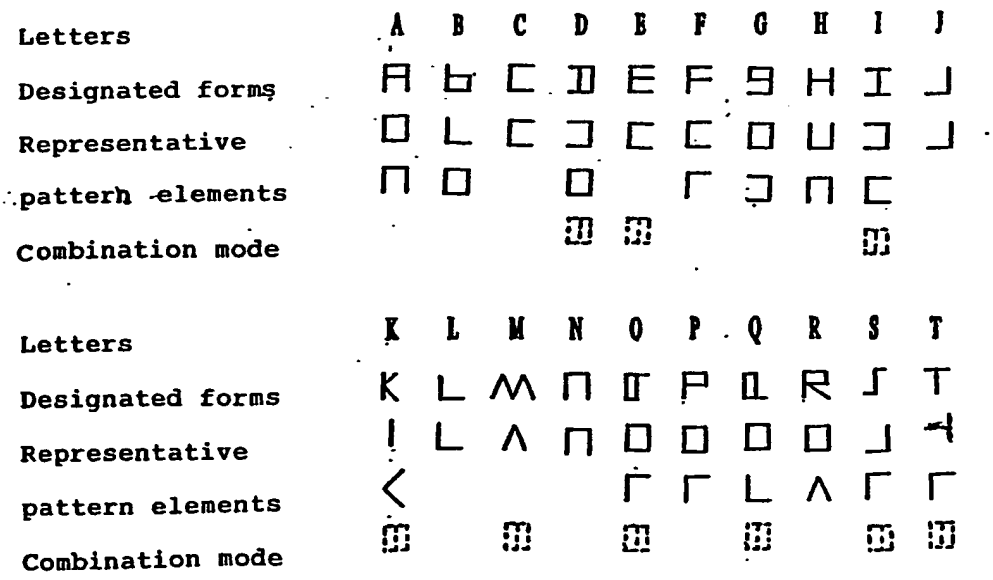
The symbol [] indicates that two pattern elements are concatenated side by side, and can also be assigned with a new meaning as "repeat", making the input faster. For example, the

Greek letter "  " can be decomposed into four pattern elements . We can use to represent it restead of typing two times and similarly E can be represented by .

From the decompositions of ASCII character set by the method of "plane cutting ", we can see that most of the English letters, numerals, punctuation marks and calculation operators are composed of two pattern elements. Some of them, such as * % $ etc, are composed of more than 2 pattern elements. For convenience, two characteristic pattern elements can be selected out as representative, so that the ASCII characters can be inputted by typing the 2 representative pattern elements followed by its combination mode. Besides, some characters, for example, B and 8, whose combination of pattern elements are the same. To distinguish them, one of the characters is replaced by its lower case or handwritten form, for example, N is replaced by n, O by o, B by b and G by g. As for the numerals 5 and 2, they are concatenated by two pattern elements and vertically, only the up and down sequence is reversed. If input order is not observed during keystriking, duplicated coding will occur but there is only this pair of duplicated codes. If 5 is decomposed by the method of " line breaking", the code will be and the problem of duplicated coding is solved. The above mentioned method makes input of ASCII characters simpler and easier and it is possible to key in two pattern elements simultaneously, so that the speed of input is increased. Some of the letters are composed of one pattern element (such as C). If only one pattern element is inputted, the computer cannot determine whether the inputted pattern

element " ⌐ " represents one letter or is part of a string. To avoid ambiguity the space character ⌐¬ should be adopted. Generally, we only refer to capital letters in the process of decomposition but for B,G,N,O, only small letters (or handwritten form) are used in the process of decomposition. To aid remembering, a formula "NO BIG" can be used to associate the four letters.

To input some characters, we need 4 key-strikes to enter the corresponding pattern elements. To simplify the operation, it is not necessary to stick to the designated character form when you select the representative patterns. For example, letter Q can be represented by the pattern elements "□" and " \ " and it will be done by pressing only two keys. Other characters such as X, S, T and Z, can be processed in a similar manner. Any decomposition methods can be adopted only if they are intuitive and easy to remember and will not cause duplicated codings. The results of decomposition of ASCII character set by the method of "plane cutting" are listed below:



Letters	U	V	W	X	Y	Z
Designated forms						
Representative						
pattern elements						
Combination mode						

Numerals	0	1	2	3	4	5	6	7	8	9
Designated forms										
Representative										
pattern elements										
Combination mode										

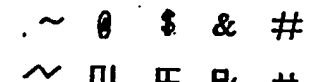
Operators	+	-	*	/	^	\	>	<	=	%
Designated forms										
Representative										
pattern elements										
Combination mode										

Punctuation marks	.	,	:	;	"	!	?	'	[	]
Designated forms										
Representative										
pattern elements										
Combination mode										

Punctuation marks	(	)	{	}
Designated forms				
Representative				
pattern elements				
Combination mode				

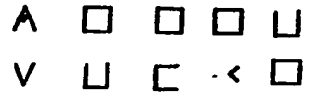
Special symbols

designed forms



Representative

pattern elements

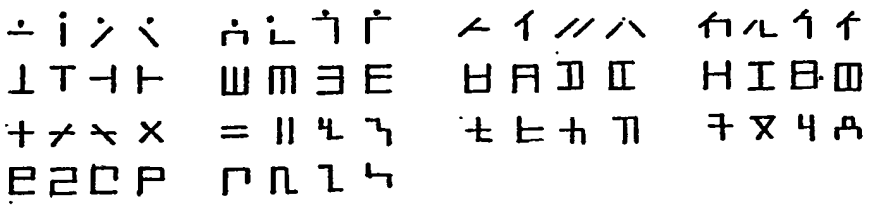


Combination mode

The shape and structure of Chinese characters are very complicated, but they can be summed up to be composed of five strokes, namely, horizontal stroke "—", vertical stroke " | ", left-falling stroke "/ ", right-falling stroke " \ " and turning stroke " √ " . We use 1,2,3,4,5 to represent them respectively. Using these five strokes, and by typing in the code of the strokes in the normal order of writing, Chinese characters can be inputted. The method of "5 keys for 5 strokes " works in this way. The 21 pattern elements of the invention includes not only the five strokes, but some combination of them as well. For example, the pattern element " □ " is the combination of the three strokes | ⌝ — . Therefore, Chinese characters can be decomposed by the method of "line taking out " into an ordered set of the 21 pattern elements, and we can input the corresponding pattern elements in normal writing order. In this way, the input of Chinese characters is performed.We call this "Method of inputting Chinese characters on pattern elements basis". For example, the

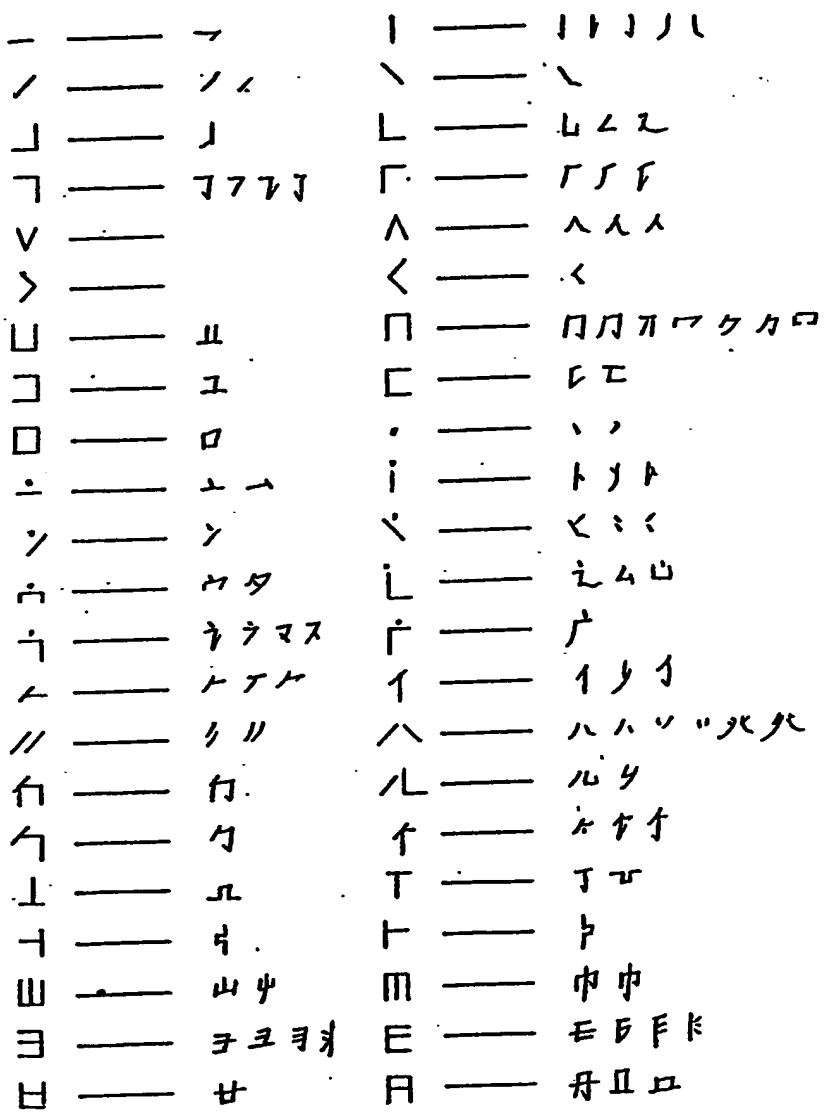
character " 国 " is decomposed into six strokes, 丨冂一丨冂一 but it can also be decomposed into three pattern elements 冂一口 . The code length of the latter is only a half of that of the former, the speed of input is higher and the rate of duplication code is lower.

It is very troublesome to input complicated Chinese characters even by the pattern elements based method. In order to increase the speed for inputting Chinese characters, the frequently used combination of strokes of Chinese characters can be defined as a Chinese letter, each letter being composed of two pattern elements. On the keyboard of pattern elements, one letter is keyed in each time and the letter can be taken as an independent code unit for Chinese characters code. According to the normal order of writing for Chinese characters and in observance of the rule of first upper then lower, first left then right and first outer then inner, the Chinese character can be decomposed into an ordered set of letters and pattern elements, the various letters and pattern elements are then typed in sequentially and the inputting of Chinese characters is thus achieved. This can be called "letter based inputting method for Chinese characters". After analyzing, abstracting and classifying the various combinations of Chinese character strokes, we obtain the following 56 letters for Chinese characters:

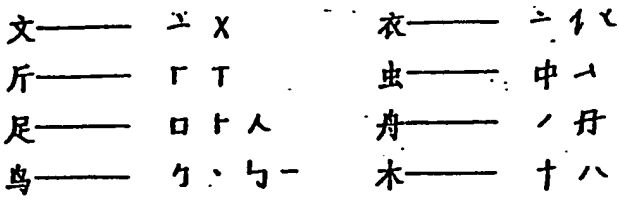


They are as simple as the English alphabet, and they are symmetrical in structure, the rules are simple and clear and easy to remember.

A letter or a pattern element can represent several combinations of stokes which are similar to each other in shape. Their correspondence relationship is as follow:



For Chinese characters with simple and clear structure, direct decomposition is appropriate. For example,



For Chinese character with intercrossed structure, it is relatively simple to decompose them by the method of "line taking out". For example,

内——人冂　　典——廿丌八
曲——廿口　　夷——大弓
臾——人臼　　用——月丨
丑——ヨ丨　　农——冂亻𠂉
冉——十冉　　也——乜丨

For Chinese characters with similar shape and structure. It is appropriate to decompose them by method of "line breaking "and in observance of the rule of "taking the bigger". For example,

土——十一　　干——工丨
半——八十丁　　王——工土
矢——𠂉土人　　羊——八王十
丰——十工一　　主——亠十一
天——工人　　夫——十一人

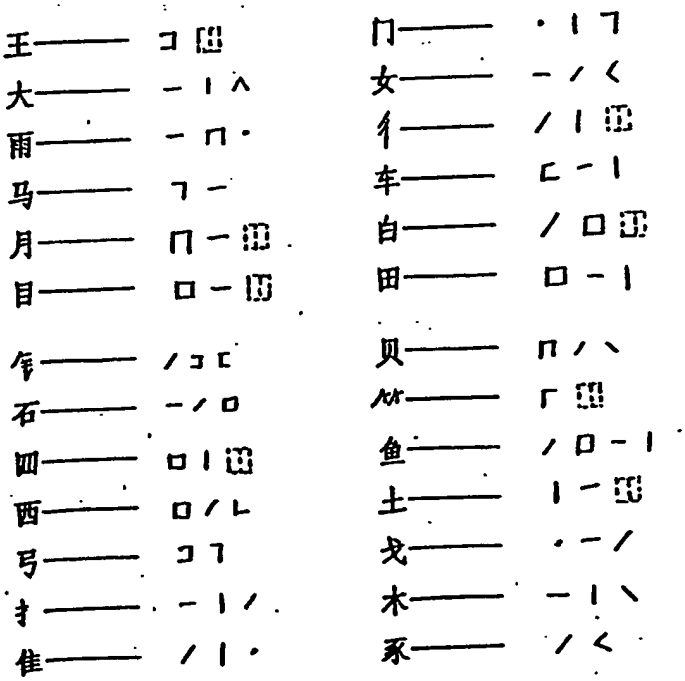
For Chinese characters with complicated structure, the method of "mixed cut " should be used, for example,

曹——廿刂日日　　捷——十丿十ヨ𠂉人
律——丿亻彳十丁　　嬈——𠂉乂十コ𠃌人

An assembly of strokes which is more complicated than the letter is called a character root such as "弓.月.目.田" etc. In order to further increase the speed for inputting Chinese characters, frequently used character roots need not be decomposed. Instead, a character root can be represented by several of its pattern elements that can best describe its structure. A character root can be inputted by typing in all the representative pattern elements of the character root simultaneously at one time. These character

roots hence are regarded as the independent code unit of the Chinese character input codes. For briefness of description, the term "character root" refers only to the 32 assemblies of strokes. In accordance with the normal writing order of the Chinese character or its structural sequence, each Chinese character is decomposed into an ordered set of a series of character roots, letters and pattern elements, and these character roots, letters and pattern elements are typed in successively. The input of Chinese characters is thus carried out. This can be called "character root based input method for Chinese characters".

According to their frequency of use, 32 assemblies of strokes are selected out as undecomposable independent character roots. Their representative pattern elements are shown as follows:



立——  　　  ——口亅卜

小——丨ノ丶　　心——乚ノ丶

——　　火—— 

For easiness of remembering, these 32 character roots can be divided into 8 categories. The character roots in these categories relate to 8 different aspects of our daily life and real world (according to their meaning in Chinese) respectively. The 8 aspects are human beings, organs, utensils, animals, materials, earth, nature and status.

王女行立、心  足、车门弓戈、马鱼隹豕、
金贝木竹、田土石雨、水火西月、大小皿白。

Assemblies of strokes with similar shape and structure can be merged, for example, "  " can be merged with " 小 ", " 月 、夕 " can be merged with "月 ".

By taking advantage of character roots, we can greatly shorten the code length for Chinese characters, for example:

姨———女大弓　　想———木目心

润———氵门王　　德———彳十皿一心

雕———冂土口隹　　琼———王亠口小

As the structure of some Chinese characters is simple while that of the others is complicated, the code length for individual Chinese character is thus variable. If the computer is desired to be able to distinguish the two Chinese character codes consecutively inputted, it is necessary to key in a "space" character after one Chinese character code is inputted.

According to the statistics disclosed in the "Dictionary of Chinese characters Information" compiled by the research group of Chinese Character Coding, Shanghai Jiao Tong University, every Chinese character can be constructed from 623 parts of different shape and structure. Each Chinese character is a planar combination of these parts. The number of parts each Chinese character comprises and the combination pattern of the parts are different from character to character. If the planar combination of the parts can be transformed accurately to a linear combination of a series of numeral codes, the uniqueness for input of Chinese characters can be achieved. For this sake, the codes of the various parts must be different and the relative positions of the parts must be completely expressed by codes. The relative positions of the parts might be correctly expressed by means of brackets "( )", horizontal combination symbol "⿰" and enclosure symbol "⿴" (the combination of "口" and ".") For example, the character "瀚" is composed of 4 parts. According to the order of first upper then lower, first left then right, and first outer then inner, this character can be expressed by the following linear expression:

氵⿰(⿱(艹⿰日月))

Similarly, the expression for "⿴王" is 口(王·) and the expression for "瘗" is :疒⿴(未女).

If the codes for these symbols are typed in according to the expression, the uniqueness of Chinese character input will be guaranteed. From this string of codes, a computer can make out the corresponding Chinese character out of the 623

parts.

All the 21 pattern elements, 56 letters and 32 character roots are called Chinese characters parts. They all have different codes--altogether 109 independent code units. These parts are called independent parts. They are about one sixth of all Chinese character parts. All other non-independent parts can be decomposed into the combinations of character roots, letters and pattern elements. For example, the part "鸟" can be decomposed into "勹,㇆一"; "里" can be decomposed into "田土", and "角" can be decomposed into 𠂉月丨.

This is actually to code 514 non-independent parts with the 109 code units. Duplication of Code can be eliminated when two code units are used to represent one part. If pattern element " , " is used to represent the bracket, 21 pattern elements can carry out the unique input of Chinese characters.

For most Chinese characters, omission of bracket, "  " symbol and enclosure symbol "  " will not cause duplicated codes. There are exceptions for a very few characters. For example, for the characters "𠂇八" and "只", the code of symbol "" cannot be omitted. Likewise, for the characters "" and "呆", the symbol "" can not be omitted. Since these exceptional cases are very few and considering that the omissions can increase input speed, we suggest to use the omissions as often as possible.

There are 6,763 frequently used Chinese characters. Each character is composed of 3 parts on average. The number of combination of the three parts is approximately 4×10^7. These frequently used Chinese characters are only two ten-thousandth of the different combinations of three parts.

Obviously, the redundancy of the input code for Chinese characters is great. The input codes can be further compressed. For example, for Chinese characters that have long code lengths, the input can be restricted to at most 3 to 4 codes, adopting a method of one, two, three, final or primary, secondary, final to fetch the code, and to omit some of the codes in between. In so doing, the duplication codes might be increased. But an operator skilled in the art can remember the characters with duplication code and will add input code correspondingly for the character with duplication codes.

For most frequently used characters, decomposition is unnecessary. They may be represented by pattern elements that can describe best their structure characteristic, the representative pattern elements can be typed in simultaneously to realize the high speed input of Chinese characters. For example,

是——日\ 不——一|/· 在—— 一/|迅的 ——口冂

Their codes are different from the codes of all the letters and character roots. They can be distinguished without the use of the "space" character. Therefore it is possible to key in a character at one time.

There are four categories of sturctures of the Chinese characters:

1.mono-structure

For example, 串、果、更、再、耳

2.Left and right structure

For example, 明、彻、悟、剖、飒

3.Upper and lower structure

For example, 吉、意、贾、想、举

4.Inner and outer sturcture

For example, 国、同、匾、厕、闲

All the letters and character roots are considered to be mono-structure.

The procedure of inputting Chinese characters by the character roots method is shown in Fig.7

As illustrated in Fig. 7, the whole procedure is divided into 4 parts.

The first part:

Character analysis —— If the character is a frequently used one, then enter 4: fetch its code and the procedure is over. Otherwise, goto 2 for furher processing.

The second part:

Structure analysis —— through the analysis 2,5,6,the category of structure of the character is to be determined, and then which part of the character is to be decomposed is determined. After this, the part resulting from the decomposition goes through a further analysis to see whether it can be further decomposed until the part that has been decomposed is of a monostructure.

The third part:

Part fetching —— through three analyses 3,7,8 to determine what kind of code (pattern element, letter, character root) is to be fetched for the mono-structure. If the code cannot be fetched directly, then the mono-structure will go through a further decomposition.

The fourth part:

Decomposing the mono-structure —— through two analyses 9,10, we can decide which method should be used to

decompose the mono-structure. After the decomposition, one of the resultant parts is taken to part fetching process. After the code is fetched the remaining part will be send to analysis 2 for structural analysing. If the part is a mono-structure, then it should be sent to 3 for fetching code analysis. This process will go on until the mono-structure is completely decomposed.

The following examples illustrate the process:

" 口 " ——→(1) frequently used character ? no ——→(2) mono-structure ? yes ——→(3) pattern element ? yes ——→ (4) fetch its code.

" 果 " ——→(1) frequently used character ? no ——→ (2) mono-structure ? yes ——→ (3) pattern element ? no ——→ (7) letter ? no ——→ (8) character root ? no ——→(9) Take out line ? no ——→(10) breaking line ? yes ——→(12) fetch the upper " 田 " (3) pattern element ? no ——→(8) character roots ? yes ——→ (4) fetch the code of "田" —— (2) the remaining " 木 " is mono-structure ? yes ——→(3) pattern element ? no ——→(7) letter ? no——→ (8) character root ? yes ——→(4) fetch the code of "木".

" 剖 " ——→(1) frequently used character, no ——→ (2) mono-structure ? no ——→(5) left and right structure ? yes (3) fetch the left part " 音 " ——→(2) mono-structure ? no ——→(5) left and right structure ? no ——→(6) upper and lower structure ? yes ——→(4) fetch the upper part "立" ——→(2) mono-structure ? yes ——→(3) pattern element ? no ——→(7) letter ? no ——→(8) character root ? yes ——(4) fetch the code of " 立 " ——→(2) the remaining " □ " on the left is a mono-structure ? yes ——→(3) " □ " is a pattern element ? yes ——(4) fetch the code of " □ " ——→ (2) " 刂 " on the right is a mono-structure ? yes ——→(3) pattern

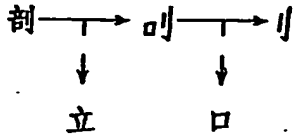
element ? no ⟶(7) letter ? yes ⟶(4) fetch the code of "丨".

The whole decomposition procedure looks very complicated, but actually there are only eight kinds of structures for frequently used Chinese characters:

杜  枷  悟  剖 

旱  意  萍  盟 

Decomposition and code fetching should observe the order illustrate as above.



After repeated practice a user becomes experienced and skilled, and, for example, can readily decompose the character "剖" into 立口丨, Input and decomposition can be done simultaneously. This is like the situation when a person writes; he never considers, at the time he begins the first stroke, where the next stroke will begin, in what direction and how long it will be, etc. Once a habit is formed, it becomes natural.

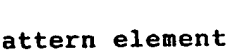
If the letters based input method is used to input Chinese character, the decomposition procedure is just the same as that of the character roots based input method, only that it is not necessary to judge whether a part is a character root. When pattern element based input method is used, it is not necessary to judge whether a part is a letter or character root.

As the phonetic letters of chinese characters is expressed by English letters, naturally, they can be inputted

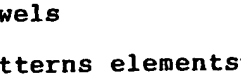
directly by means of a pattern elements keyboard. But the current phonetic letter based inputting methods for Chinese characters are all designed for use on English keyboards, which does not make full use of the advantages of the Chinese language and the speed of key in is too low. For example, the phonetic letters for the character "光" is "guang". As it ends in "g", a consonant, the demarcation between the characters is not clear and definite, a space character is needed as a demarcation line. Altogether we need six key-strikings to input the character " 光 " .

The Chinese vowels are constructed out of the following 8 letters (or string)a,o,e,i,u,ü n,ng. If each of the 8 letters (or string) is represented by a pattern element. All the vowels can be expressed by the pattern elements as shown below:

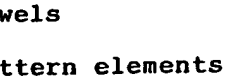
Vowels a o e i u ü n ng

Pattern element 

Vowels ai ei ao ou an en ang eng ong

Patterns elements 

Vowels ia ie iao iou ian in iang ing iong

Pattern elements 

Vowels ua uo uai uei uan uen uang ueng

Pattern elements 

Vowels üe üan ün

Pattern elements 

Among them, the pattern elements for "ai" and "ia", "ei" and "ie","ou" and "uo" are the same, but the sequence is different. In order to facilitate the input of one vowel at one strike of key, the sequence information must be cast away. This will cause duplicated codes. In order to eliminate duplication codes, after the three vowels "ia", "ie", "uo", a pattern element "  " is added. Their last letters all comprise an enclosed pattern "□". It is easy to remember.

Thus it can be seen that the representative pattern elements of all the vowels will not exceed three. It is possible to press down three pattern element keys simultaneously to input one vowel at one strike of key. Since every Chinese character has only one vowel and the vowel always appears at the end of the phonetic letters, the demarcation between words is very clear so that no space character is needed. Therefore it needs only two key strikes to input the character "光". The number of key-striking decreases two thirds and the speed of input doubles.

If Chinese characters are inputted by employing words and expressions, it is only necessary to add a space character at the end of the words or expressions. As the code length of words and expressions is comparatively longer, the duplication codes rate will be substantially reduced. This will give full play to the information richness of Chinese characters and makes it possible to input Chinese characters faster than the input of English words.

To input a consonant with only one key-striking three

symbols "ㄓ、ㄔ、ㄕ" are used to represent the three consonants "zh、ch、sh", and the capital letter T is used to represent the consonant "t". The following results are obtained by means of the decomposition method of "plane cutting":

consonants b p m f d T n L

Pattern elements 

consonants g k h j q x

Pattern elements 

consonants z c s r ㄓ(zh) ㄔ(ch) ㄕ(sh)

Pattern elements

The total number of vowels and consonants of the Chinese characters is 56. The combination of their representative pattern elements are all different to each other. There is no duplication code. It is possible to input a vowel or a cosonant at one time.

Five pattern elements " — / \ | • " are used to represent respectively the five tones namely, level tone, falling-rising tone, falling tone, entering tone and light tone. The tone symbol will be inputted following each vowel. Notice that the pattern elements for the four tone symbols are identical to the representative pattern elements of the vowel symbols "ï、a、ig、i".But if it is guaranteed that a tone symbol must be inputted for every character, then no confusion will be caused and this can futher reduce the duplication code rate.

Most currently used coding methods for inputting

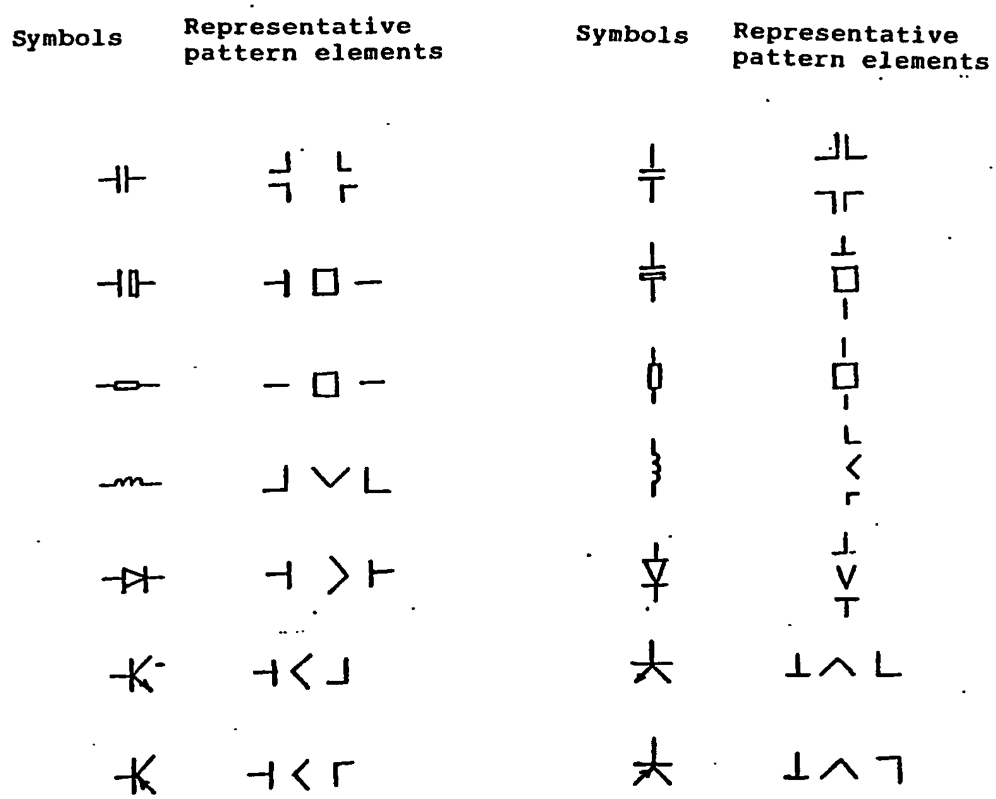
Chinese characters, such as intonation coding method, structure coding method, intonation & structure coding method, structure & intonation coding method and five-stroke coding method are designed for use on a English keyboard, and in most cases, one letter or numeral is used to represent a vowel, consonant or several Chinese character parts. Since the keyboard of the invention can be used to input all letters and numerals intuitively, all these currently used inputting methods can be adopted with the keyboard of the invention as their corresponding hardware.

The keyboard can also be used to input French, Russian, Arabic, Japanese and Korean characters. If only the 21 pattern elements are marked on a conventional English keyboard and the keyboard management program is revised, the characters can be inputted with the pattern element based input method of the present invention.

The pattern elements themselves are a number of simple structured graphic representations. A complicated structure can be decomposed into a combination of simpler structures. Therefore, the present invention can also be applied to input some graphical symbols. For example, the symbol for capacitor "⊥" consists of two parts "⊥" and "⊤". "⊥" can be decomposed into "⌋" and "⌊", and "⊤" can be decomposed into "⌝" and "⌜". First inputting "⌋⌊" and then inputting "⌝⌜", the symbol "⊥" is inputted. Symbol "→" can be decomposed into "—>". Symbol "↘" can be decompesed into "<⌋". Symbol "△" can be decomposed into "∧—". A complicated structure can be represented by some of its characteristic pattern elements, only if there is no duplication code in the

set to which the structure belongs. To input a symbol, we only need to type in its corresponding pattern elements.

Through decomposition and simplification, the symbols frequently used in electronic schematic diagrams are coded as a series of pattern elements. The correspondence relationships between these symbols and pattern elements are illustrated as follows:



Other structures, such as block diagrams and flow diagrams can also be inputted in a similar way.

Compared with the conventional computer keyboard and other currently used methods, the pattern element based input method and the corresponding keyboard have the following advantages:

1. The keyboard has fewer keys and is easy to use and remember. The positions of the 13 pattern element keys on the keyboard is easy to remember, easy for one-handed typing, easy to locate, suitable for typing withut looking at the keyboard, and suitable for a pocket-size computer. The keyboard and the method can also be applied to electronic recording card, game machine, telephone apparatus, it is also convenient for remote-controlled operation.

2.The keyboard can be used for inputting characters of several different languages without altering the symbols marked on the keys.

3.It has flexibility of combination, suitable for the need of computer development. Combined key-striking is one of the special features of the invention. If 13 pattern element keys are used, there will be more than 8000 combinations. It is sufficient to meet the requirement of future development of computers. Some combination of the pattern elements can be used to construct characters (such as 日月人 etc.). They can be used as command symbols. It is simple and easy to remember.

4.The Method is suitable for inputting graphical symbols, the pattern elements of the elementary pattern set can be used to construct more complicated graphical symbols. So some commonly used regular graphical symbols can be coded and inputted intuitively. On a conventional keyboard, this is

very difficult to achieve.

5.They provide a systematic, complete, easy to learn and easy to use method for the input of Chinese character and the corresponding keyboard is flexible, light in weight and small in size. Compared with other currently used Chinese character input methods, the present invention has the following advantages:

(1) The patterns and letters are regularly structured and so easy to remember. There are too many parts of Chinese characters, their structures are complicated and not easy to remember. The 21 pattern elements and 56 letters according to the invention are very simple, regular, symmetrical and easy to remember. 32 letters relates to eight aspects of our daily life. So it is not very hard to remember them by association.

(2) The method can be used to code characters more accurately and comprehensively. There are 110 independent code units (including the symbol ⊡) of the invention. The form and structure characteristics of Chinese characters can be coded accurately and comprehensively. It can not only input Chinese characters without duplication codes, but also be used to construct new Chinese characters. The currently used method based on combination of character parts uses one letter to represent several Chinese character parts. The information about the difference among the structure of these parts is lost. So the duplication code rate is bound to be high.

(3) The method is easy to learn and the users can make progress in a step by step manner. The invention includes the following methods: pattern element based input method, letter based input method and character root based input method. Users

can learn these methods form the simple ones to the sophisticated ones. The sophisticated method is based on the simpler ones and the methods are closely related to each other. All users, beginners or professionals of different level can find the most suitatable method for themselve.

(4) The combination is flexible and efficient--- There are 13 pattern element keys on the keyboard. For one-handed operation, at most five keys can be struck sumultaneously. The number of combinations of the five keys is 2379. Now, only 114 of them have been used and the rest, over two thousand of them, remain undefined. Therefore, there is plenty room for defining codes for more character parts and characters. These undefined combinations make it possible for future expansion of character set or character part set, thus providing a good foundation for fast Chinese character input.

(5) The method is suitable for both a phonetic coding system as well as a structure coding system. With this method, both the structure code and phonetic code of Chinese character can be inputted.

If a single code is assigned for each consonant, compound vowels and intonation, it is possible to input Chinese characters quickly by phonetic coding method.

(6) A new gesture language can be developed --- when the position of pattern elements is fixed each character corresponds to a definite gesture (the hand gesture for striking the keys to input the character). This gesture language can be used to exchange information in some cases.

Embodiments of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 shows the arrangements of a basic pattern element keyboard,

Fig. 2 shows the arrangement of a basic pattern element keyboard with its rows of keys shifted relative to each other,

Fig. 3 shows the arrangement of a keyboard designed for an IBM-PC computer,

Fig. 4 is an external view of the keyboard for an IBM-PC computer,

Fig. 5 is a schematic circuit diagram of keyboard for IBM-PC computer,

Fig. 6 shows the arrangement of a keyboard for two-hand typing on an IBM-PC computer, and

Fig. 7 is a program flow chart of a decomposition process and code fetching of Chinese characters.

Practical examples of the present invention will be described with reference to the corresponding illustrations as follows:

Fig. 1 shows the layout of pattern elements on a keyboard of the present invention, the keys being carefully arranged so that the symbols on the keys are symmetrically positioned which makes the locating of keys very easy. Fig. 2 shows, on the basis of Fig. 1, that each row of keys is shifted for half of the key width to the right, and the "angle key" is placed on the leftmost position of the bottom row. This arrangement is helpful in the operation of pressing down simultaneously two adjacent keys in adjacent rows, and is convenient for one-handed operation.

Fig. 3 shows the keyboard arrangement for an IBM-PC computer. It has only 16 keys, yet has all the functions of the original keyboard (83 keys) and can be connected directly to a PC computer for operation. Besides the above-mentioned 13

keys, there are 3 additional keys added to the keyboard, i.e. one "edit" selection key, one "function" selection key and one "command" selection key, and these additional keys have been marked with 3 additional symbols, namely, one edit symbol, one function symbol and one command symbol. When the "edit" selection key is pressed down simaltancously with a pattern element key, the keyboard will output a corresponding edit code. When the "function" selection key is pressed down simultaneously with a pattern element key, the keyboard will output a corresponding function (F0-F9) code. When the "command" selection key is pressed down simultaneously with a pattern element keys the keyboard will output a corresponding command code.

Each selection key has three functions. The "angle selection" key also has the function of "clear" and "addition calculation"; the "edit" selection key also has the function of "shift" and equal-sign; the "function" selection key also has the function of "Ctrl" and multiplication calculation; and the "command" selection key also has the function of "Alt" and division calculation. When the "clear" key is pressed, the last inputted pattern element is cleared and is useful for correcting mistyping. Pressing the "shift" key, followed by typing a character, causes the keyboard to output a shift code followed by the character code. Thus if the keyboard is in a "capital letter" state, it will output a small letter code,and vice versa. Pressing the "Ctrl" key, followed by typing a character, causes the keyboard to output a "Ctrl" code followed by the character code. Pressing the "Alt" key, followed by typing a character, causes the keyboard to output an "Alt" code

followed by the character code.

If "Calcu" command is inputted, the keyboard will be turned to a "calculator" state. In this state, combined key striking is unnecessary. Each key corresponds to an operator of a numeral and the function keys are used as numeral keys (for example, F1-F9 represent numeral 1-9), pattern element "-" represents the minus sign, and pattern element "." represents the decimal point.

"Sound" command makes the keyboard produce an audible response after a character is inputted.

Symbol "↵" represents return, and symbol "←□" functions as a Backspace key.

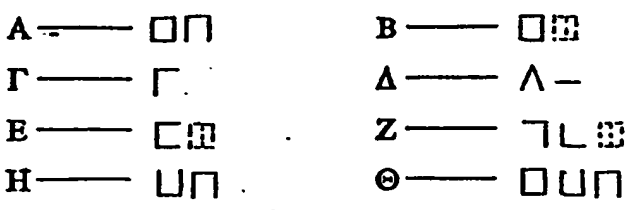
Fig. 4 is the outside view of the keyboard for an IBM-PC computer showing 16 keys arranged in a 4 x 4 array with the keyboard connected to the computer by a five-pin cable. The five-pin plug can be inserted in the keyboard interface socket on an IBM-PC computer. This keyboard has all the functions of an IBM-PC computer keyboard (83 keys) and can be used as a substitute for the original keyboard.

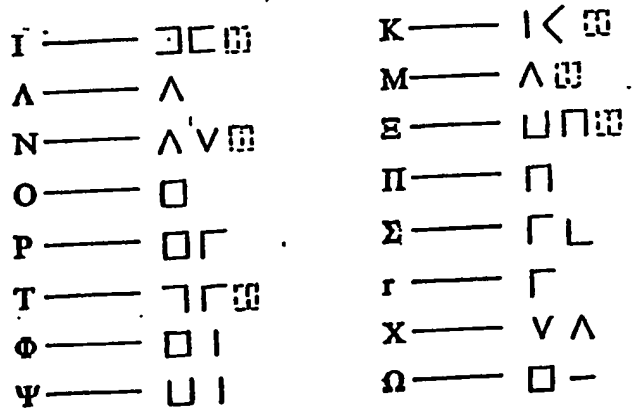
Fig. 5 is a schematic circuit diagram for the keyboard. The most important part of the circuit is a single-chip micro processor (8749). The function of interface 1 is keyboard scanning. The four most significant bits of interface 1 successively and cyclically output three "1" signals and one "0" signal. The four least significant bits of interface 1 read in the state of 16 keys. "0" will be read when a key is pressed and, on releasing the key, "1" will be read. The state of the 16 keys can be represented by 16 binary bits. The number of 0's is the number of keys pressed down. The positions of "0"

expresses the positions of the keys being pressed. The monitor program of the micro processor will convert the key state codes into IBM-PC key position code and then send it to interface 2 as serial code. The output of P21 is a serial key position code, the output of P20 is a synchronous clock signal. In order to enhance the driving capability, both of them are outputted by driver 7404. T1 is connected to the clock host machine. When the host machine requests the keyboard type the micro processor in the keyboard reads in the state of T1 and sends the keyboard information to the host.

Fig. 6 shows a keyboard for two-handed operation on an IBM-PC computer. It has 27 keys. " [ ] " key is designed as a bar, suitabe for combined key-striking. To strike the keys with both hands can increase the speed of typing, especially when the typing is performed on desk top.

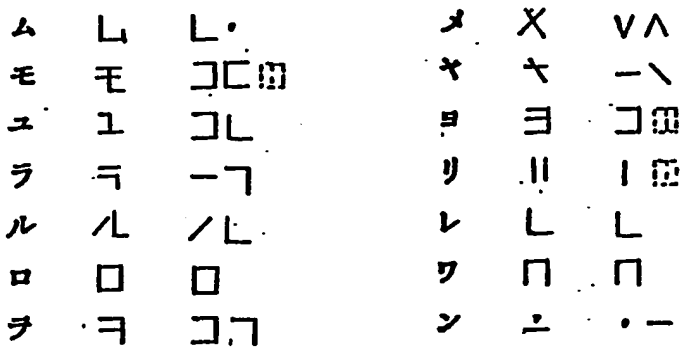
The Greek alphabet can be regarded as an independent character set. It is difficult to distinguish the Greek characters " Δ " and " O ". To avoid decomposition into identical codes, " Δ " should be decomposed into " Λ " and " — " instead of " Δ ", thus duplicated coding of " Δ " and " O " can be avoided. " Φ " and " Ψ " can be decomposed by the method of "line taking out" and the other characters can be decomposed by the method of "plane cutting". The results obtained are as follows:





The Japanese Katakana, after removing the hook stroke and transforming all angles to right angles, can be easily decomposed into pattern element strings:

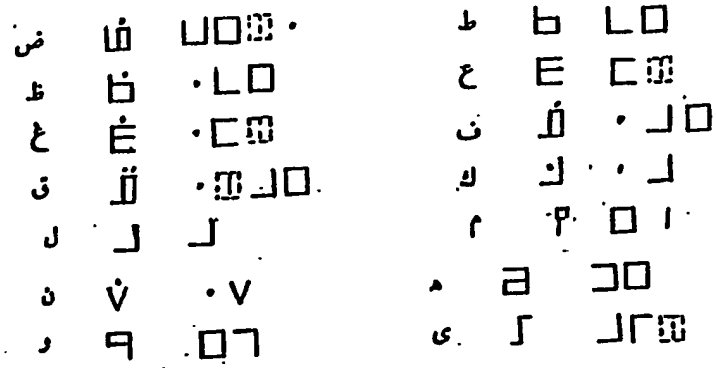
Letters	Forms abstracted	Pattern elements	Letters	Forms abstracted	Pattern elements
ア	フ	ㄱ/	イ	亻	/丨
ウ	宀	・冂	エ	工	コ匚
オ	才	一丨/	カ	力	亅冂
キ	𠂉	丶一▯	ク	𠂆	乚冂
ケ	𠂇	乚冂厂	コ	コ	コ
サ	廾	凵冂	シ	シ	・/丶
ス	𠂊	ㄱ・▯	セ	七	亅匚
ソ	ソ	・/	タ	冃	口冂
チ	千	コ匚丨	ツ	ツ	・▯/
テ	テ	一▯/	ト	ト	丨・
ナ	ナ	一/	ニ	二	一▯
ヌ	扌	コ厂	ネ	ネ	・ㄱ丨
ノ	ノ	/	ハ	ハ	/丶
ヒ	匕	乚匚	フ	冖	冖
ヘ	𠂆	𠂆	ホ	ホ	一丨/丶
マ	冖	ㄱ・	ミ	ミ	丶▯



Among them, "ユ" and "モ" are duplicated codes (they are decomposed into the some pattern string). If we define the pattern string of "ユ" to end with a "[]" and "モ" without a "□",the problem will be solved. Letters "ン" and "ンツ" are diffecult to distinguish. In order to eliminate duplicated coding, "\" is used to substitute "・", therefore its code is "・/\".

Arabic letters can also be decomposed into pattern elements. To facilitate decomposition, they will first undergo a transformation process, that is, replacing the curved lines with straight line segments, but preserving its structure characteristics. For example, the letter "ﺒ" can be transformed to "ﺐ", and then it is easy to decompose. The results of decomposition are shown as follows:

Letters	Forms abstracted	Pattern elements	Letters	Forms abstracted	Pattern elements
ا			ﺒ		
ﺖ			ﺚ		
ﺠ			ﺤ		
ﺨ			ﺪ		
ﺬ			ﺮ		
ﺰ			ﺲ		
ﺶ			ﺲ		



"·□" represents " . . "; " ,□" represents " ⋮ ".
On the right side of each letter, there is the corresponding pattern string code. During the process of input and code fetching. Some of the pattern elements can be ignored but only if this will not cause duplicated coding.

When we use the character root based input method, in accordance with the rule of "taking the bigger", we should first fetch the character roots, then the letters and finally the pattern elements, and arrange them according to the rule of first upper then lower, first left then right and first outer then inner.

For example, the character " 堅 " can be decomposed into three character roots "田土土" and two letters " マ丁 " . According to the order of decompostion, they should be coded as "田土マ丁土".

" 園 " can be decomposed into character root " 土 ", letters " イ 乂 " and pattern elements " □ □ ". The outer hollow square □ should be representd by " ⊡ ". According to the order of decomposition the character " 園 " should be coded as " ⊡土口イ乂 ".

If the code length of each character is restricted to only four, we should select the first, second, third and last component in the code a string of compononts. So the code for " 野 " will be " 田土マ土 " and the code for " 園 " will be "⊡土口𠂉".

When Chinese characters are inputted by letter based input method, the codes for the character " 野 " should be "日十一マ丁十一", and the coders for " 園 " should be "⊡十一口亻𠂉".

If the code length is restricted to only five, we should select the first, second ,third, fouth and the last component out. So the code for "野 " of the full code, will be "日十一マ工 " and the code for "園" will be "⊡十一口𠂉".

When Chinese characters are inputted by pattern element based input method, each Chinese character should be decomposed into pattern elements according to the normal writting order of the character the code for "野 " should be "口一|一 一ㄱ・一|一|一 ・ " and the code for "園 " should be "口一|一口/|/丶 ".

If the code length is restricted to only six, we should select the first, second, third, fourth, fifth and last component out of the complete code thus, the code for " 野 " will be "口一|一ㄱ一 ・・" and the code for "園" will be "口一|一口丶".

Since there is a correspondence between strokes (and their combinations) and pattern elements and character letters, we can input characters on a pattern element keyboard. In practice, it is not so complicated as described above. If character root based input method is used, the character should

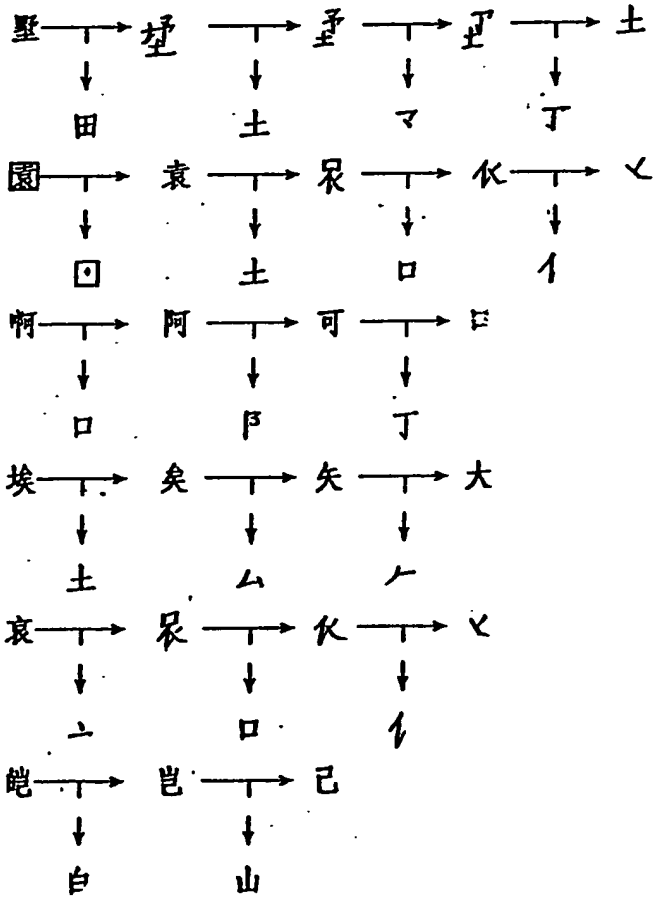
be decomposed according to its structure and the decomposition process should observe the normal writting order of Chinese characters. Meanwhile the input can be carried out by striking the relevant keys.

For example:

啊———口阝丁口　　埃———土厶𠂉大

哀———亠口亻𠂆　　皑———白山己

The decomposition process for these characters by the character root based input method is shown as follows:



If the letter based input method is to be used, the above character roots should be further decomposed. If the pattern element based input method is to be used, then the character root and the character letter should be further decomposed into pattern elements.

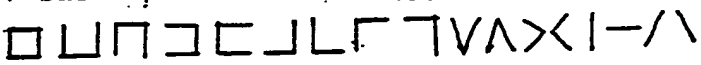
It should be understood that the embodiments of the invention are only illustrative. They do not imply any restriction of the invention. The essential concepts and characteristics of the present invention are stated in the claims as follows.

CLAIMS

1. A method for inputting characters and/or symbols in which a plurality of basic pattern elements each of simple pattern form is used for coding the characters/symbols to be inputted, comprising decomposing, according to a set of specified rules, each character/symbol to be inputted into a set of said basic pattern elements characterising the shape of the character/symbol and inputting each character/symbol by entering its decomposed set of basic pattern elements via a keyboard having keys marked with each of said basic pattern elements.

2. A method according to claim 1, in which the plurality of basic pattern elements comprises at least one group of basic pattern elements, the basic elements of the or each group having the same simple pattern form but in different orientations.

3. A method according to claim 1 or 2, in which the said plurality of basic pattern elements includes the following 17 basic pattern elements:



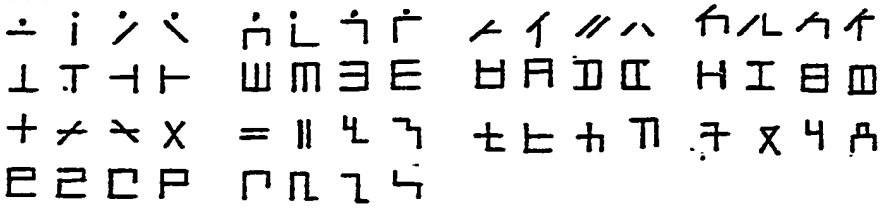
4. A method according to claim 3, in which the said plurality of basic pattern elements further includes the pattern elements • and , .

5. A method according to claim 4, in which the said plurality of basic pattern elements includes pattern elements representing a symbol, e.g.  , for a space character and a symbol, e.g.  , for combination mode selection.

6. A method according to any of claims 3 to 5, in which, when ASCII characters are to be inputted, the number of basic pattern elements in each of said sets of basic pattern elements for all the different ASCII characters is from one to three.

7. A method according to any of claims 3 to 5, in which when Chinese characters are to be inputted, each Chinese character is decomposed into its said set of basic pattern elements according to the rule of first upper part then lower part of the character, first left part then right part of the character, first outer part then inner part of the character, the basic pattern elements of any decomposed set being entered sequentially via the keyboard.

8. A method according to any of claims 3 to 7, in which different combinations of two basic pattern elements are defined as letters of Chinese characters and a set of the said letters at least includes the following:



each set of basic pattern elements comprising at least one letter and/or at least one basic pattern element.

9. A method according to any of claims 3 to 8, in which different combinations of from two to four basic pattern elements are defined to represent character roots of Chinese characters and a set of said character roots includes at least 王女亻立、心目

扌足、车门弓戈、马鱼隹豕、金贝木竹、田土石雨、水火西月、大小皿白。

10. A method according to any of claims 3 to 9, in which some of the most frequently used Chinese characters are not decomposed according to the set of specified rules but are represented by at least one basic pattern element to enable the quick inputting of the character.

11. A method according to any of claims 3 to 10, in which the eight vowel letters of the phonetic letters of Chinese characters, i.e. a, o, e, i, u, ü, n, ng, are represented, respectively, by eight of the said basic

pattern elements, compound vowels or consonants of a Chinese character are represented by two or three of said vowel letters and the five Chinese tones, consisting of the level tone, the following-rising tone, the falling tone, the entering tone and the light tone, are represented by five pattern elements, respectively, whereby a Chinese character can be inputted by entering the basic pattern elements of its set representing the vowel letter, consonant and intonation of the character.

12. A method according to any of the preceding claims, in which electronic symbols for inputting are decomposed into sets of basic pattern elements.

13. A method according to any of the preceding claims, in which said characters and/or symbols which can be decomposed and inputted include all the characters of English, French, German, Russian, Greek, Arabic, Korean, Japanese, and Chinese and a variety of symbols frequently used in electronic circuit diagrams, logic circuit diagrams and computer program charts.

14. A keyboard for inputting various characters and/or symbols, comprising a plurality of depressible keys marked with a plurality of basic pattern elements each of simple pattern form representative of part of a character/symbol which can be used separately or in combination to represent the shape of any character or symbol to be entered.

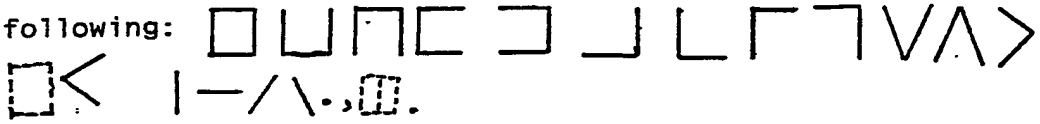
15. A keyboard according to claim 14, in which the basic pattern elements include a closed pattern, four channel-shaped patterns oriented at 90° relative to one another, four angular-shaped patterns oriented at 90° relative to each other and each consisting of a horizontal line and a vertical line, two patterns representing, respectively, right- and left-pointing arrow heads, a V-shaped pattern, an inverted V-shaped pattern, a vertical line, a horizontal line, a forward sloping line, a backward

sloping line, a full stop-like pattern and a comma-like pattern.

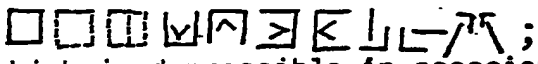
16. A keyboard according to claim 15, in which the basic pattern elements further include a pattern, e.g.  , representing a space character and a pattern, e.g. , representing combination mode selection.

17. A keyboard according to claim 15 or 16, in which the said channel-shaped patterns are of angular form.

18. A keyboard according to claim 15, 16 or 17, in which the said closed pattern is in the form of a square.

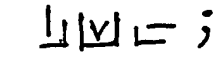
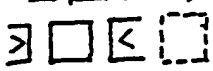
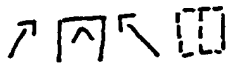
19. A keyboard according to any of claims 14 to 18, in which the said basic pattern elements include at least the following: 

20. A keyboard according to any of claims 14 to 19, in which each key has at least two of said basic pattern elements marked thereon.

21. A keyboard according to claim 19 and 20, in which there are at least thirteen keys, twelve of which are marked with two basic pattern elements each as follows: 
and one of which is depressible in association with one of the said twelve keys to select which of the two basic pattern element marked on the key is to be inputted.

22. A keyboard according to claim 21, in which the said twelve keys are arranged in a first row, a second row beneath the first row and a third row beneath the second row, each row comprising at least four keys.

23. A keyboard according to claim 22, in which, from left to right, the keys in the first row are marked

 the keys in the second row are marked  and the keys in the third row are marked  .

24. A keyboard according to claim 23, in which the said one select key is provided at on end of the third row.

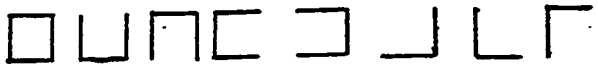
25. A keyboard according to any of claims 21 to 24, in which each of the said twelve keys is also marked with an "edit" symbol, a "function" symbol and/or a "command" symbol.

26. A keyboard according to claim 25, including four "selection" keys depressible to clear the previously entered basic pattern element or elements or to change the semantic meaning of the next key to be depressed.

27. A keyboard constructed and arranged substantially as herein described with reference to, and as illustrated in, Figure 1, Figure 2, Figure 3, Figure 4, Figure 5 or Figure 6 of the accompanying drawings.

28. Electrical equipment, e.g. a computer, provided with a keyboard as claimed in any of claims 14 to 27.

29. A method for inputting characters and symbols characterised in that a set of simple patterns and their orientations are used as the basic elements for coding the characters and symbols, in that each character/symbol to be inputted is decomposed into a set of said basic elements according to a set of specified rules and in that each character/symbol is inputted by typing in the basic elements of its set.

30. A keyboard for use in inputting various characters and symbols having keys with the following basic pattern elements marked thereon:   .

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